

report in the NAUTILUS (xliii, 104, 1930), he told of its discovery at Estes Park, Colo. He states in the supplement that "With it was *Carychium*, another genus not before reported from Colorado, which leads to a suspicion that after all both may have been introduced." Chamberlin and Jones do not include it in their "Catalogue of the Mollusea of Utah (University of Utah, Biological Series, Vol. 1, No. 1, June, 1929)"

In Aug., 1941, Mr. Calvin Goodrich and I collected one specimen of *Z. harpa* in Shoshone Canyon, 1 mile west of Elephant Head, Park Co., Wyo. (about 10 miles east of the East Gate of Yellowstone National Park), and two specimens on the hillside at the edge of Horseshoe Park, Rocky Mountain National Park, Colorado. The Colorado station is not far from Estes Park, but Shoshone Canyon is more than 300 miles distant.

*Zoögenetes harpa* seems to be as scarce in the Rocky Mountains as it is in northern Michigan. In the Drummond Island region of Michigan I have collected six specimens from five localities. During several summers I have taken tens of thousands of small snails from Arnold Island, in Whitney Bay of Drummond Island; I found only one example of *Z. harpa*. From some fifty stations in the surrounding area I have collected many times that number of small snails, including only half a dozen of *Z. harpa*. It is, perhaps, this scarcity of the species that accounts for the few western records.

It would seem safe to include *Zoögenetes harpa* (Say) in the native fauna of the Rocky Mountains.

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## FOOD HABITS OF *HAPLOTREMA MINIMUM* ANCEY AND HABITS OF ASSOCIATED MOLLUSKS ON THE MILLS COLLEGE CAMPUS

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Three species of snails and one slug are associated with the carnivorous mollusk, *Haplotrema minimum* Ancey, on the Mills College campus. The common associates are *Helminthoglypta arrosa holderiana* Cooper and *Helminthoglypta diabloensis* (Cooper); the mollusks less commonly found in association with

*H. minimum* are the garden snail pest, *Helix aspersa* Müller, and the large slug, *Ariolimax columbianus* Gould.

The typical habitat of *H. minimum* is found beneath water-carried debris and eucalyptus branches and leaves on the banks of Leona creek. In such a habitat the ground is moist throughout all but the summer months. Occasionally, however, individuals have been taken from beneath eucalyptus bark away from the creek, where moisture conditions are less favorable.

*H. minimum* has been observed feeding on young and adults of *H. arrosa holderiana* and *H. diabloensis* in the field, and on the young of *H. aspersa* in the laboratory. Individuals confined to terraria with adults of *H. aspersa* and of *A. columbianus* have never been observed to feed upon these two typical herbivores through starvation periods of 90 days. Neither did they feed on one another during this interval.

Even though it is not common, because of a usual lack of food supply, to find large aggregates of carnivorous snails in one area 7 individuals of *H. minimum* have been taken together. These were collected in an area 2 by 4 feet from beneath eucalyptus leaf humus in crevices in the moist soil substratum. Three *H. arrosa holderiana* were collected with this carnivore aggregate. Three other *Haplotrema* were collected from moist eucalyptus leaves covered by eucalyptus bark. Three *H. diabloensis* adults and 6 young were also taken in this habitat.

FOOD HABITS OF HAPLOTREMA.—Individuals of *Haplotrema* have been confined to terraria with all of the above species of land mollusks. The following pertinent data have been gathered concerning feeding activity.

In one terrarium 2 *Haplotrema* began feeding on a young *H. arrosa holderiana* 10 mm. in height. The 2 predators approached and made contact with the food snail simultaneously. The predators could be seen working their lips as they explored the shell. One then thrust its head into the aperture of the food snail and the other rasped an area of shell from the apical whorls. Twenty-five minutes were required for the completion of the feeding process. Occasionally during the feeding act a dark-colored portion of the prey was observed passing down the alimentary canals of the feeding snails.

The feeding activities were carried on beneath the rays of a 60 watt bulb placed a foot away from the terrarium. Activity carried on under such conditions probably indicates that this carnivore will feed at any time during the daylight hours. Twenty individuals have been observed in the field between the hours of from 1 to 4 P.M. actively crawling about under conditions of daylight. Many more have been gathered in an extended condition between the same hours.

Five *Haplotrema* were placed in a terrarium with 2 adult individuals of *H. aspersa*. Twenty-three minutes after the geotropic *Haplotrema* were placed in the terrarium one climbed to where the extended helices were at rest and moved its head over the posterior foot regions of the latter and then returned to the bottom of the terrarium. No feeding attempt was made, although the *Haplotrema* had been without food for a known 24 hours. These species were left together for 24 days, when they all went into aestivation.

This data possibly indicates that *H. minimum* does not relish adult *Helix*, although the carnivore has often been observed filing through the fragile shells and devouring the soft parts of immature individuals, 10–15 mm. in height of the latter species.

One observation indicates that *H. minimum* will attack but not eat larger individuals of *H. aspersa*. An immature snail 23 mm. in length was observed moving about at 9:30 A.M. Three inches above the floor of the terrarium this individual came in contact with a distended but inactive *H. minimum*. As the garden pest moved over the head of the carnivore the latter withdrew its tentacles. The *Helix* stopped its forward motion and for 2 minutes remained feeling about over the head of the *Haplotrema*. Suddenly the lips of the carnivore were noted to protrude against the ventral surface of the head of the *Helix*. The latter rapidly withdrew into its shell and dropped to the bottom of the terrarium. Here it remained inactive with the aperture turned upward for approximately 60 seconds and then righted itself and began moving about. On examination a gash 2 mm. in length and .25 mm. at the point of maximum width was observed on the ventral side of the head. The gash was roughly triangular in shape. The wound was obviously inflicted when

the *Haplotrema* made its sudden attack to rid itself of the prying *Helix*.

It is suggested here that individuals of *Haplotrema minimum* may serve as an effective control for the garden snail, *Helix aspersa*, in certain areas of the campus. It was shown above that although *Haplotrema* has not been observed feeding on adult garden snails, it does devour young ones. Extensive collecting in areas of the campus where *Haplotrema* abounds has not revealed garden snails even though environmental conditions are suitable for their abundance.

HABITS OF ASSOCIATED SNAILS.—*Helminthoglypta arrosa holderiana* and *H. diabloensis* are found in similar habitats on the Mills College campus. Individuals of these species have been most abundantly collected from beneath fallen eucalyptus tree bark and from beneath fixed but loose bark. They have been taken up as high as 3 feet on a eucalyptus trunk, although they are to be gathered in greater quantity beneath started bark at the base of these trees, where conditions of moisture are more favorable. The latter species is not uncommonly found beneath brush piles on the campus. Collecting data indicate that both species aestivate beneath eucalyptus bark during warm spells in May (Fahrenheit temperature 79–85 degrees). During foggy days following warm ones they break through the epiphragm and actively move about in search of food. Both species have also been taken from beneath water-carried debris on the banks of Leona creek. *H. arrosa holderiana* has been taken from eucalyptus "islands" in Redwood Park above the campus. In 4 instances isolated eucalyptus trees were examined and all yielded specimens. Since *H. arrosa holderiana* and *H. diabloensis* have apparently become firmly established in an introduced habitat afforded by eucalyptus trees it would seem that these snails are very adaptable species. Pilsbry (1939) reports the habitat of *H. diabloensis* sent to him by the eminent California land snail collector, Allyn G. Smith, as follows, "It is a snail of the foothills, frequently found in rock piles, but more often under logs, brush, or other deciduous cover. . . . It does not normally live near San Francisco Bay or the ocean."

*Ariolimax columbianus* is abundant along the banks of Leona

creek beneath ivy, where it has abundant moisture and good protection from the sun. The writer has collected individuals only singly. This snail is abundant in canyons behind the campus where the live oak, *Quercus agrifolia*, and poison-oak, *Rhus diversibola*, abound. Two individuals have been taken feeding on poison oak. This species has been collected crawling about during the daylight hours.

Thanks are due to Dr. G. Dallas Hanna and Mr. Allyn G. Smith of the California Academy of Sciences, San Francisco, for identifying some of the species discussed here. I wish to express my gratitude to my assistants and students of beginning zoology of the spring semester of 1941 for collecting snails from the campus.

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#### NOTES AND NEWS

MORE SINISTRAL GASTROPODS.—The note in the current NAUTILUS about a sinistral *Succinea* calls to mind instances of heterostrophy in other land snails which have recently come to my attention. The first of these is a specimen of *Polygyra cereolus* taken by my wife Ruth Ingersoll Baily at Hillsboro, Florida, in the spring of 1940. It is bleached white but otherwise in perfect condition. It is the form described by Dr. Pilsbry as having whorls of narrow caliber, and therefore more of them, than a typical specimen of *P. c. carpenteriana* of the same size. The other is a specimen of *Micrarionta levis*, taken by me on the salt flats south of Santo Domingo, Baja California, this past August. It is badly broken, only about half the body whorl remaining, but the peristome is complete and there is no doubt as to its sinistrality.—JOSHUA L. BAILY, JR.

VIVIPARUS MALLEATUS IN NIAGARA RIVER.—On Sept. 16th I found a 2¾ inch dead shell of *Viviparus malleatus* Reeve on the Niagara River shore of Cayuga Island, Niagara Falls, N. Y. Today, Oct. 23rd, I picked up 4 live and 5 dead specimens ranging